

A NEW PALAEONISCID FISH FROM THE WITTEBERG SERIES
(LOWER CARBONIFEROUS)
OF SOUTH AFRICA

By

R. A. JUBB

Albany Museum, Grahamstown.

(With 1 plate and 2 figures in the text)

CONTENTS

	PAGE
Introduction	267
Genus <i>Mentzichthys</i> nov.	270
<i>Mentzichthys walski</i> sp. nov.	270
Discussion	272
Acknowledgments	272
Summary	272
References	272

INTRODUCTION

In May 1963 Mr. G. Walsh, an official of the Sundays River Irrigation Board, discovered a deposit of fossil fishes in the mountains just south of Lake Mentz and close to the entrance of Karroo Poort. Mr. J. J. G. Blignaut, a retired geologist, visited the site immediately and confirmed the importance of its discovery. Since the beds are well exposed, from the upper portion of the Witteberg quartzites through the complete sequence of Upper Witteberg Shales to the Dwyka Tillite, it was possible for Mr. J. A. Marais of the Geological Survey Department to determine the geological horizon on which the fossil fish occur. The fossiliferous bed, which is nearly vertical and from three to six inches thick, occurs 740 feet above the topmost white quartzite of the Witteberg and in the upper shales which were formerly known as the Lower Dwyka Shales. These shales are regarded as of lacustrine origin.

Lithologically, according to Haughton (1963), the Series, as now defined, consists of fine-grained thinly bedded whitish quartzites intercalated with dark green or blue (buff when weathered) micaceous shales and flagstones. Locally lenses of grey sandy limestone or calcareous quartzite, sometimes carrying plant fragments, are present, as well as bands of coarse grit. The uppermost member (formerly Lower Dwyka Shales) consists mainly of greenish and bluish shales and flagstones with some hard sandstone bands.

The most characteristic fossil in the quartzites of the series is the spiral

impression known as *Spirophyton* which is characteristic of the Middle Devonian of America. Other fossils previously discovered, although scanty, include *Bothrodendron*, *Cyclostigma* (characteristic of the Carboniferous of Queensland and New South Wales), *Didymophyllum*, *Halonia*, *Knorria*, *Lepidodendron*, *Lepidostrobus*, *Singularia*, *Selaginites* and *Stigmara*. Fragments of the body segments of a eurypterid named *Hastimima* have also been discovered, as well as some fish scales. A recent discovery by Mr. J. A. Marais is a species of *Psilophyton*. In age Du Toit (1954) considers these non-marine beds, about 4,000 feet in thickness, to embrace the whole time interval from about the Middle Devonian to the Lower Carboniferous, and it is to this latter period that the Lake Mentz fish fossil bed appears to belong.

An outstanding feature of the exposed section of the fossil bed is the concentration of fish impressions it contains. This concentration spoils what could have been, in many cases, perfect impressions. As stated above, the maximum thickness containing fishes varies from three to six inches but the extent of the bed is unknown as it dips and disappears. Under normal circumstances sediments of this thickness would represent an appreciable interval of time, but, from the great number of fishes overlapping one another, and the disposition of some, it is evident that a mass mortality involving a large concentration of Palaeozoic fishes occurred. Such a mass mortality, followed by perfect preservation, could only have taken place if the primeval pool of lake they were inhabiting was completely frozen over in the first place. Total freezing would have resulted first in the concentration of fish in the bottom layers, then asphyxiation followed by preservation in the bottom muds under freezing conditions before being finally entombed by some major earth or glacial movement. The open mouths of many of the fishes suggest asphyxiation due either to deoxygenation of the water by the fishes themselves, or to their being forced down into a deoxygenated hypolimnion.

Although the Witteberg Series is associated with lacustrine conditions, certainly non-marine, it would be misleading to regard the Lake Mentz fossils as being those of entirely freshwater species. Of the Palaeozoic and Mesozoic fishes described from southern Africa many belong to widely distributed genera and families which are associated with both marine and non-marine formations. Rayner (1958) quoting Gunter points out that, as a general rule, marine fishes are more tolerant of fresh waters than vice versa. There is ample evidence of this today where marine species such as *Carcharinus leucas*, *Pristis microdon*, *Megalops cyprinoides* and *Glossogobius giuris* are all found up to 300 miles by river from the sea in many of the rivers of the east coast of Africa.

The Lake Mentz fossil fishes represent two distinct species and possibly a third. Of the two more complete species one is a platysomid-like fish with very large dorsal ridge scales, and the other a slender stream-lined palaeoniscid which is described below as representing a new genus and species. The generic name refers to the type locality and the specific name is in honour of the discoverer of the fossil bed.

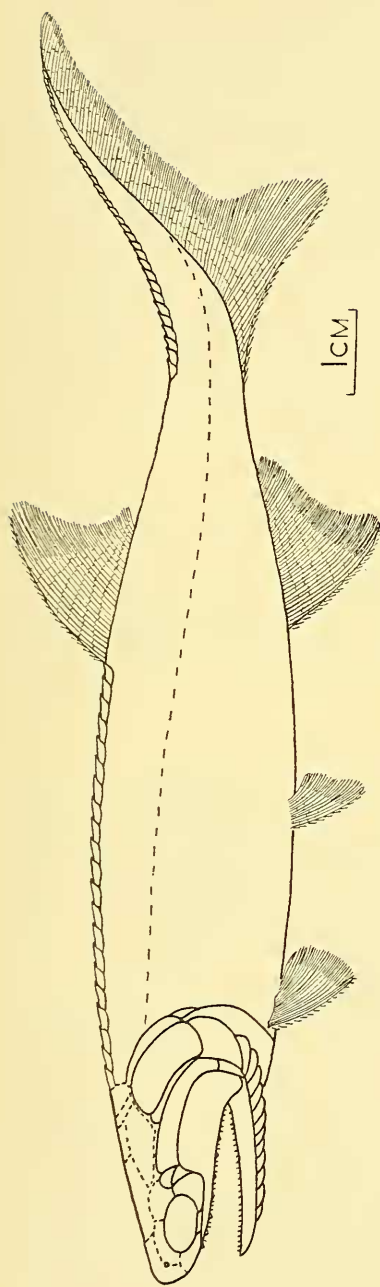


FIG. 1. *Mentzichthys walshi*. Restoration of type, squamation not shown.

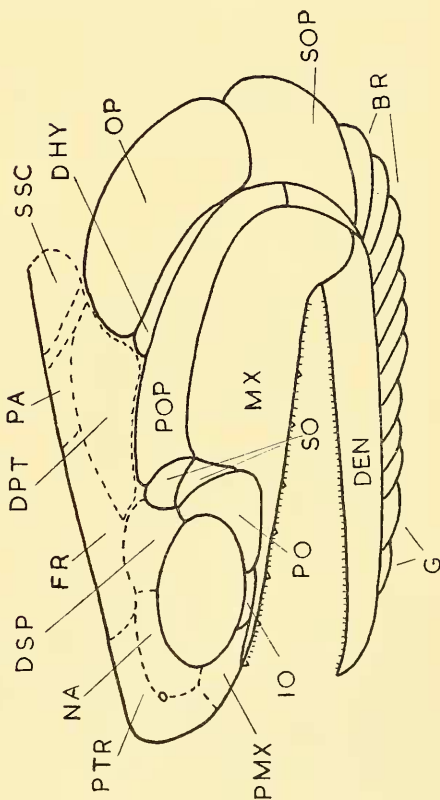


FIG. 2. *Mentzichthys walshi*. Restoration of the skull in lateral view. Dotted lines indicate indistinct sutures.

KEY:

BR. branchiostegal rays; DEN. dentary; DHY. dermohyal; DPT. dermopterotic; DSP. dermosphenotic; FR. frontal; G. median gular and gular; IO. infraorbital; MX. maxillary; NA. nasal; OP. opercular; PA. parietal; PMX. premaxilloantorbital; PO. postorbital; POP. preopercular; PTR. postrostral; SO. suborbital; SOP. subopercular; SSC. suprascapular.

Family **Palaeoniscidae**Genus **MENTZICHTHYS** nov.

Definition: Body fusiform and elongate; principal rays of pectoral fins not articulated till towards their terminations; dorsal and anal fins situated posteriorly, moderate in size, triangular in shape, the former originating slightly ahead of the latter; caudal fin heterocercal, inequilobate and deeply cleft, the axial lobe being well developed; distinct fulcra on all fins; head with prominent rostrum and relatively large anteriorly placed orbit with large postorbital; suspensorium very oblique, gape wide, teeth consisting of short well-spaced cutting teeth and fine conical teeth on the maxillary, and numerous fine conical teeth on dentary; opercular large, larger than subopercular, branchiostegal rays fairly numerous, head bones sculptured with striae and tubercles; scales rhombic, of moderate size, with large peg-and-socket articulation, entire posteriorly, ridge-scales running from the occiput to the origin of the dorsal and along the leading edge of the caudal fin.

Mentzichthys walshi sp. nov.

(Figures 1, 2. Plate VI A, B)

Specific diagnosis: Slender fusiform fishes whose maximum total length appears to be about 18 cm., the length of the head being contained about four and a half times, and the greatest depth six and a half times in the total length of the body.

The Skull

The shape and arrangement of the bones of the skull are shown in Figure 2, which has been prepared, allowing for distortion, from three impressions of heads which were cleaned and then polished with a nylon brush before photographing. Plasticine casts were also used for reconstructing the skull, broken lines being used in the final drawing where sutures could not be determined with confidence.

The ornament of the frontals, supratemporals, parietals and post-temporals consists of striae running more or less antero-posteriorly. The postrostral is ornamented mostly with tubercles which extend down to the nasals (see Plate VI A). The branchiostegal rays are not ornamented but the large and prominent postorbital bone is markedly rugose. Numerous transverse striae ornament the maxillary and particularly the dentary. The suspensorium is very oblique. The opercular and subopercular are also ornamented, the former being much larger than the latter. The teeth showing on the dentary are minute and numerous, similar teeth appear on the maxillary but there are well spaced short cutting teeth as well which are confined to the anterior and middle section.

The Paired Fins

Preservation is not good enough to detect ornamentation of the supracleithrum or cleithrum. The pectoral fin, situated low down ventrally, is medium in size with a base length about one third that of the longest lepidotrichia. The lepidotrichia, which number about 19 are unarticulated and unbranched until their distal ends. The anterior edge of the pectoral fin is covered with small fulcra. The pelvic fin, whose origin is about midway between the origin of the pectoral and the origin of the anal, is relatively small with about 13–15 lepidotrichia which are articulated and distally branched. The anterior edge is covered with small fulcra.

The Unpaired Fins

The dorsal fin, which is situated nearer to the caudal fin than to the head, is one and a quarter times as high as the length of the base. It is triangular in shape with from 28–35 lepidotrichia which are articulated and branched distally. The anal fin, whose origin is posterior to that of the dorsal, has a base longer than its height. It is triangular in shape with 35–45 lepidotrichia which are articulated and branched distally. Small fulcra are present along the anterior edge. One of the outstanding features of this new species is the large axial lobe of the caudal fin. This fin is distinctly heterocercal, deeply cleft and inequilobate, the leading edge being covered with ridge scales.

Squamation

Not many scales are available for examination as, in most of the samples, just the underneath pattern of the squamation appears in the impression. The scales are medium in size and rhombic in shape with pronounced peg-and-socket articulation. The few scales available, mostly immediately posterior of the head, show transverse furrows with pits, the posterior edges being rough but entire. There are from 16–18 rows of scales from the dorsal to the ventral surface at the point of maximum girth, and 52–58 scales along a lateral series. Moderately enlarged ridge-scales, numbering about 21, extend from the occiput to the origin of the dorsal fin. Ridge-scales of a similar size anteriorly extend along the caudal peduncle and up the leading edge of the caudal fin.

Material

The holotype is an impression on a slab No. A.M./64/4562 in the Albany Museum, Grahamstown. A photograph of this is shown in Plate B. This slab, from two to three inches thick, has numerous impressions on both faces. Other samples of importance in constructing the illustrations in Figures 1 and 2 were A.M. 64/4563, A.M. 64/4564 and A.M. 64/4565, in the Albany Museum. Further material, S.A.M. K1169 and S.A.M. K1170 is preserved in the South African Museum, Cape Town.

DISCUSSION

Reasonably entire specimens of *M. walshi* have the following extreme measurements:

Total length: 90 mm. Std. length: 70 mm.

Total length: 145 mm. Std. length: 110 mm.

From these measurements it has been possible to estimate the maximum size of incomplete fossils to be about 180 mm. The type, Figure 1 and Plate B, has a total length of 145 mm.

M. walshi belongs to the group of palaeoniscids having a very oblique mandibular suspensorium (Woodward, 1891). The remarkable development of the axial caudal lobe, the smaller orbits and the large postorbital bones distinguish this new genus from *Rhadinichthys* Traquair, 1877 as re-defined by Moy-Thomas and Dyne (1938). These features, as well as the larger opercular, distinguish *Mentzichthys* from the genus *Cycloptychius* Young, 1865, as re-defined by the same two authors. Of the known palaeoniscids it would appear that *Mentzichthys* is most closely related to those of the Lower Carboniferous assigned to the genus *Cycloptychius*.

ACKNOWLEDGMENTS

I wish to thank Professor Orvar Nybelins of Stockholm, Sweden, for reading this paper in its draft form and for providing valuable comments. Dr. H. V. Eales of the Department of Geology, Rhodes University, assisted by his team of senior students, provided the material from which the holotype of *M. walshi* was selected. This project, carried out in collaboration with Dr. T. H. Barry, was part of a research programme sponsored by the C.S.I.R., who also granted funds for the publication of this work.

SUMMARY

A new palaeoniscid fish *Mentzichthys walshi* n. gen. et sp. is described from the Witteberg Series (Lower Carboniferous) of South Africa, just south of Lake Mentz in the eastern Cape. It is suggested that a mass mortality of these fishes took place in lacustrine conditions under ice.

REFERENCES

- DU TOIT, A. L. 1954. *The geology of South Africa*. 3rd ed. Edinburgh & London: Oliver & Boyd.
- HAUGHTON, S. H. 1963. *Stratigraphic history of Africa south of the Sahara*. Edinburgh & London: Oliver & Boyd.
- MOY-THOMAS, J. A. & DYNE, M. B. 1938. The actinopterygian fishes from the Lower Carboniferous of Glencartholm, Eskdale, Dumfriesshire. *Trans. roy. Soc. Edinb.* **59**: 437-480.
- RAYNER, D. H. 1958. The geological environment of fossil fishes. In WESTOLL, T. S., ed. *Studies on fossil vertebrates*: 129-156. London: Athlone Press.
- WOODWARD, A. S. 1891. *Catalogue of the fossil fishes in the British Museum (Natural History)*. **2**. London: British Museum.